

**Response**

Page 2 of 9

Serial No.: 09/560,268

Confirmation No.: 2517

Filed: April 26, 2000

For: COMPOSITIONS FOR SELECTIVELY ETCHING AGAINST COBALT SILICIDE (As Amended)**Remarks**

The Office Action mailed October 22, 2003 has been received and reviewed. No claims have been amended or cancelled. Therefore, the pending claims are claims 64-65, 67-76, 89-90, and 92-95. Reconsideration and withdrawal of the rejection of such claims is respectfully requested in view of the remarks provided herein.

**The 35 U.S.C. §103 Rejection****Claims 64-65 and 67**

The Examiner rejected claims 64-65 and 67 under 35 U.S.C. §103 as being unpatentable over Nakano et al. (U.S. Patent No. 6,110,839), Shiramizu (U.S. Patent No. 6,116,254), and Wei (U.S. Patent No. 4,350,564). Applicants respectfully traverse this rejection.

Applicants submit that claim 64 is not *prima facie* obvious because the cited references do not teach or suggest all of the elements thereof. For example, as recognized by the Examiner, Nakano et al. does not teach an etching composition that includes a ratio of mineral acid:peroxide:deionized water in a range of about 1:1:25 to about 1:1:15. Rather, Nakano et al. shows a cleaning solution that according to the Examiner has a ratio of about 1:1:10.

The Examiner, however, alleges that chemical concentration is a result-effective variable as shown by Wei, and that it would have been obvious for one skilled in the art to determine the chemical composition through test runs in order to obtain an optimum chemical concentration to provide a solution to remove metal impurities with a reasonable expectation of success.

However, there is no motivation or suggestion given to modify the cleaning solution disclosed in Nakano et al. such that it includes a ratio of mineral acid:peroxide:deionized water in a range of about 1:1:25 to about 1:1:15 as recited in claim 64. Although the Examiner asserts that one skilled in the art would find it obvious to determine the chemical composition through test runs in order to obtain an optimum chemical concentration to provide a solution to remove metal impurities with a reasonable expectation of success, such assertions are not appropriate in this case.

## Response

Page 3 of 9

Serial No.: 09/560,268

Confirmation No.: 2517

Filed: April 26, 2000

For: COMPOSITIONS FOR SELECTIVELY ETCHING AGAINST COBALT SILICIDE (As Amended)

The Examiner asserts, essentially, that it would have been "obvious to try" different chemical ratios through "test runs" to arrive at the chemical ratios recited in pending claim 64. Applicants respectfully submit that "obvious to try" is an impermissible standard to use in an obviousness determination. *In re Antonie*, 559 F.2d 618, 195 U.S.P.Q. 6 (C.C.P.A. 1977); *In re Tomlinson et al.*, 363 F.2d 928, 150 U.S.P.Q. 623 (C.C.P.A. 1966). There must be a suggestion or teaching in the prior art that Applicants' claimed invention could or should be prepared. *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (C.A.F.C. 1991); *In re O'Farrell*, 853 F.2d 894, 7 U.S.P.Q.2d 1673 (C.A.F.C. 1988). It appears that it is only in hindsight, e.g., with use of knowledge of Applicants' disclosure, that the Examiner can arrive at the conclusion that Applicants' invention is obvious.

For example, only after review of Applicants' disclosure and obtaining knowledge that the cleaning composition of Nakano et al. may be capable of etching particular materials such as cobalt and metal nitride at particularly advantageous rates, did the Examiner recognize that the cleaning solution of Nakano et al. was capable of doing more than cleaning at ratios even more dilute than that described in Nakano et al.

Further, the Examiner cites Wei and alleges that chemical concentration is a result-effective variable. However, Wei describes the use of a dilute solution of mineral acid etchants and not an etching composition having the components as described in the pending claims or a cleaning solution as present in Nakano et al. Therefore, it is inappropriate to equate the solutions and necessarily assert that dilution of the present composition would have the same effect as dilution of the solution described in Wei.

Yet further, for example, Nakano et al. describes a cleaning solution that includes a ratio of mineral acid:peroxide:water at 1:1:10 which the Examiner alleges is to be modified so as to take the form of an etching composition as claimed. However, the etching composition claimed includes a ratio of mineral acid:peroxide:deionized water in a range of about 1:1:25 to about 1:1:15. When modifying Nakano et al., the solution thereof would have to be further diluted to achieve the Examiner's intended result. This goes against the teachings of the present invention which use the etching composition (which is more dilute than the cleaning solution of Nakano et

## Response

Page 4 of 9

Serial No.: 09/560,268

Confirmation No.: 2517

Filed: April 26, 2000

For: COMPOSITIONS FOR SELECTIVELY ETCHING AGAINST COBALT SILICIDE (As Amended)

al.) to etch, for example, cobalt and/or metal nitride. In other words, if the cleaning solution of Nakano et al. is modified as alleged by the Examiner to become more dilute so as to allegedly encompass the present invention, the modified cleaning solution would become less reactive and remain more of a cleaning solution as opposed to having etching characteristics as described according to the present invention. Although the etching rates are not a part of the pending claim 64 (but are clearly part of other claims addressed below), the above supports the fact that chemical concentration is not necessarily a recognized result effective variable, particularly when the end result involves the etching of different materials.

For at least the above reasons, claim 64 is not obvious in view of the cited references. Further, claims 65 and 67 are also patentable over the cited references by reason of their dependency on claim 64 and by reason of their own limitations.

Claims 68-76, 89-90, and 92-95

The Examiner also rejected claims 68-76, 89-90, and 92-95 under 35 U.S.C. §103 as being unpatentable over Nakano et al., Shiramizu, and Wei, and further in view of Vanell et al. (U.S. 5,945,346). Applicants respectfully traverse this rejection.

The Examiner alleges that claims 68-76, 89-90, and 92-95 are obvious over the cited references for substantially the same reasons as claims 64-65 and 67, using the addition of Vanell et al. to assert that chemical reactions of a solution are sensitive to temperature.

Claims 68, 73, 89, and 94 are not *prima facie* obvious over the cited references because the cited references do not teach or suggest all of the elements of such claims. For example, the cited references do not teach or suggest an etching composition comprising a mineral acid, a peroxide, and deionized water at a ratio in a range of about 1:1:35 (mineral acid:peroxide:deionized water) to about 1:1:15 (mineral acid:peroxide:deionized water) as described in claim 68; an etching composition comprising a mineral acid, a peroxide, and deionized water at a ratio in a range of about 1:1:35 (mineral acid:peroxide:deionized water) to about 1:1:15 (mineral acid:peroxide:deionized water) as described in claim 73; an etching composition consisting essentially of a mineral acid, a peroxide, and deionized water at a ratio in

## Response

Page 5 of 9

Serial No.: 09/560,268

Confirmation No.: 2517

Filed: April 26, 2000

For: COMPOSITIONS FOR SELECTIVELY ETCHING AGAINST COBALT SILICIDE (As Amended)

a range of about 1:1:35 (mineral acid:peroxide:deionized water) to about 1:1:15 (mineral acid:peroxide:deionized water) as described in claim 89, or an etching composition comprising a mineral acid, a peroxide, and deionized water at a ratio in a range of about 1:1:25 (mineral acid:peroxide:deionized water) to about 1:1:15 (mineral acid:peroxide:deionized water) as described in claim 94.

The same arguments regarding the lack of motivation and suggestion to modify the concentration of the cleaning solution described in Nakano et al. as presented above with reference to claim 64 are equally applicable to claims 68, 73, 89, and 94.

However, yet further, the cited references do not describe an etching composition that has an etch rate greater than about 1000 Å/minute for cobalt at a temperature in a range of about 20 degrees centigrade to about 100 degrees centigrade as described in claim 68, an etching composition that has an etch rate of about 50 Å/minute to about 250 Å/minute for metal nitride at a temperature in a range of about 20 degrees centigrade to about 100 degrees centigrade as described in claim 73, or an etching composition that has an etch rate of about 50 Å/minute to about 250 Å/minute for metal nitride at a temperature in a range of about 20 degrees centigrade to about 100 degrees centigrade and an etch rate greater than about 1000 Å/minute for cobalt at a temperature in a range of about 20 degrees centigrade to about 100 degrees centigrade as described in claim 89.

In other words, the cited references do not describe etching compositions that have the etch rates for the particular materials as claimed. Even though the references may recite similar components used in cleaning compositions, nothing in such references would lead one skilled in the art to an understanding that the specific etch rates for either cobalt and/or metal nitride are necessarily present. Just because the references have similar components in the cleaning solutions described therein, does not necessarily mean that such solutions can necessarily be used to achieve specific etch rates for specific materials as recited in the claims. As a result, one skilled in the art would not recognize that the etch rates as recited in the pending claims would necessarily be present with the cleaning compositions described in the references cited.

**Response**

Page 6 of 9

Serial No.: 09/560,268

Confirmation No.: 2517

Filed: April 26, 2000

For: COMPOSITIONS FOR SELECTIVELY ETCHING AGAINST COBALT SILICIDE (As Amended)

For example, even though Nakano et al. recites similar components used in the etching composition, nothing in Nakano et al. would lead one skilled in the art to modify the cleaning solution thereof such that the specific etch rates for either cobalt and/or metal nitride are necessarily present. Just because Nakano et al. has similar components in the cleaning solution described therein does not necessarily mean that this solution would necessarily be modified to achieve specific etch rates for specific materials as recited in the claims. As a result, one skilled in the art would not modify the cleaning solution of Nakano et al. such that etch rates as recited in the claims would necessarily be present therein.

It would appear that the Examiner is alleging that once routine experimentation is completed with the cleaning solution of Nakano et al. and a solution that falls in the claimed ranges is found (i.e., a false allegation as explained below), that the etch rates for particular materials is inherent in such solutions. However, Applicants submit that the Examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art. *Ex parte Levy*, 17 U.S.P.Q.2d 1461,1464 (Bd. Pat. App. & Inter. 1990). Based on the arguments presented above, Applicants respectfully submit that the Examiner has not met the burden to prove that the asserted etch rates are necessarily present in the references cited.

The following is provided in contradiction of the assertions that the etch rates for particular materials are inherent from the cleaning solution of Nakano et al. as modified in chemical concentration (i.e., modified based on the Examiner's allegations that chemical concentration is a result-effective variable). First, there is no motivation or suggestion given to modify the cleaning solution of Nakano et al., or any of the other compositions in the cited references, to etch metal nitrides and/or cobalt as is provided by the present invention. Nakano et al. is merely a cleaning solution and it would not have been obvious to modify a cleaning solution to etch particular materials at particular rates described in the pending claims.

The Examiner asserts that one skilled in the art would find it obvious to determine the optimum or workable ranges of temperature and concentration ratios through routine experimentation for the etching or removal of metal with a reasonable expectation of success.

**Response**

Page 7 of 9

Serial No.: 09/560,268

Confirmation No.: 2517

Filed: April 26, 2000

For: COMPOSITIONS FOR SELECTIVELY ETCHING AGAINST COBALT SILICIDE (As Amended)

However, the Examiner must look at the references as a whole and not in isolation. Nakano et al. describes various etching compositions in addition to the cleaning composition. There is no reason for one skilled in the art to modify the cleaning composition described in Nakano et al. to achieve an etching composition as described in the pending claims. Nakano et al. clearly recognizes the difference between cleaning and etching and there is no suggestion or motivation for the cleaning solution of Nakano et al. to be modified to provide etching of metal nitrides and/or cobalt as described in the pending claims. In fact, there would be no reasonable expectation of success to etch cobalt and/or metal nitride with the cleaning solution of Nakano et al. when the cleaning solution thereof is diluted further as is alleged by the Examiner in order to achieve the ratios present in the pending claims.

Yet further, the Examiner cites Wei and alleges that chemical concentration is a result-effective variable. However, Wei describes the use of a dilute solution of mineral acid etchants and not an etching composition as described in the pending claims or a cleaning solution as present in Nakano et al. Therefore, it is inappropriate to equate the solutions and necessarily assert that dilution of the present composition would have the same effect as dilution of the solution described in Wei, particularly when considering the etch rates of particular materials which are clearly not all reactive to the same types of solutions.

For example, Nakano et al. describes a cleaning solution that includes a ratio of mineral acid:peroxide:water at 1:1:10 which the Examiner alleges is to be modified so as to etch particular materials at particular etch rates as described in the pending claims. However, to modify the cleaning solution of Nakano et al. to arrive at the etching compositions as claimed, the cleaning solution of Nakano et al. would have to be further diluted to achieve the desired result. As indicated above, one would not expect success in the etching of, for example, cobalt and/or metal nitride, if such dilution is used to modify the cleaning solution of Nakano et al.

In other words, if the cleaning solution of Nakano et al. is modified as alleged by the Examiner to become more dilute so as to allegedly encompass the present invention, the modified cleaning solution would become less reactive and remain more of a cleaning solution as opposed to having etching characteristics as described according to the present invention.

**Response**

Page 8 of 9

Serial No.: 09/560,268

Confirmation No.: 2517

Filed: April 26, 2000

For: COMPOSITIONS FOR SELECTIVELY ETCHING AGAINST COBALT SILICIDE (As Amended)

This supports the fact that chemical concentration is not necessarily a recognized result effective variable, particularly when the end result involves the etching of different materials.

For at least the above reasons, claims 68, 73, 89, and 94 are not obvious in view of the cited references. Further, claims 69-72, 74-76, 90, 92-93, and 95 are not obvious over the cited references for substantially the same reasons as claims 68, 73, 89, and 94 by reason of their dependency thereon and by reason of their own limitations.

**Response**

Page 9 of 9

Serial No.: 09/560.268

Confirmation No.: 2517

Filed: April 26, 2000

For: COMPOSITIONS FOR SELECTIVELY ETCHING AGAINST COBALT SILICIDE (As Amended)**Summary**

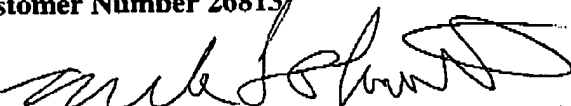
It is respectfully submitted that the pending claims are in condition for allowance and notification to that effect is respectfully requested. The Examiner is invited to contact Applicants' Representatives, at the below-listed telephone number, if it is believed that prosecution of this application may be assisted thereby.

Respectfully submitted for  
**Lee et al.**

By  
Muetting, Raasch & Gebhardt, P.A.  
P.O. Box 581415  
Minneapolis, MN 55458-1415  
Phone: (612) 305-1220  
Facsimile: (612) 305-1228  
Customer Number 26813

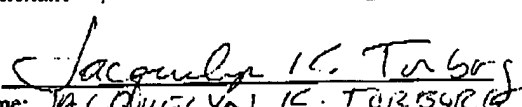
22 Jan 2004

Date

By:   
Mark J. Gebhardt  
Reg. No. 35,518  
Direct Dial (612)305-1216

**CERTIFICATE UNDER 37 CFR §1.8:**

The undersigned hereby certifies that the Transmittal Letter and the paper(s), as described hereinabove, are being transmitted by facsimile in accordance with 37 CFR §1.6(d) to the Patent and Trademark Office, addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 22<sup>nd</sup> day of January, 2004, at 2:00pm (Central Time).

By:   
Name: JACQUELYN K. TURBERG